NOTES, ABSTRACTS, AND REVIEWS.

DEGREE OF PROBABILITY OF FORECASTS.

A foot-note attached to Mr. C. Hallenbeck's article in the MONTHLY WEATHER REVIEW for November, 1920, page 645, "Forecasting precipitation in percentage of probability," calls attention to the fact that a plan for expressing the degree of assumed reliability of a forecast numerically was suggested by Freiherr von Myrbach in 1913, and that a method of this character was used by the military meteorologists of the allied armies during the late war. It appears, however, that the history of such forecasts extends back much further. An ingenious mathematical method of predicting the percentage of probability of rainfall from the values of the principal meteorological elements at an observation hour is set forth in Dr. Louis Besson's article "Essai de prévision méthodique du temps, in Annales de l'Observatoire Municipal de Montsouris," volume 6, 1905, pages 173–495, which anticipates to a large extent the article by Dr. Bruno Rolf, Probabilité et pronostics des pluies d'été (Upsala, 1917). Moreover, a system of weighted forecasts was actually used by the official forecasters of western Australia from the beginning of the year 1905, as described by Mr. W. E. Cooke in the MONTHLY WEATHER REVIEW for January, 1906, pages 23–24. The question of adopting such a plan in the United States Weather Bureau has recently been under discussion.—*C. F. T.*

SOME SEVENTEENTH CENTURY IDEAS ABOUT THE WEATHER.[1]

551.509(048)

By C. J. P. CAVE.

[Excerpted from *Quar. Jour. Royal Met'l. Soc.* Jan., 1920, 46: 65–68 (–87).]

Pepys can not claim to be considered as a meteorologist; his references to the weather are such as anyone might make in writing a diary or in correspondence. Sometimes a month or more passes without any reference to the weather; when Pepys was with the fleet or going down the Thames by water references are more munerous, as might be expected. It should be noted that Pepys' memory for meteorological events was not always good, and his remarks on the worst or best weather he remembers must be taken with caution; for instance, he says that the night of July 13, 1667, was so hot that he lay with only a rug and a sheet over him, the first time certainly since he was operated on for stone (March 26, 1658), probably the first time since he was a boy; on July 15, 1668, it was so hot that again he lay with only a rug and a sheet over him, "the first night that I remember in my life that ever I could" do so.

The following is a short summary of the weather of the different years:

1660. The year began with a hard frost and snow; it thawed on January 10, but froze again in the middle of the month. From the end of March to the end of May, Pepys was with the fleet under Lord Sandwich, first in the Thames, then off Deal, and finally off the Dutch coast, whence the King was brought back to England. During this time weather notes are very numerous, but there is nothing very remarkable to record except very bad weather from the 11th to the 20th of May, with apparently an onshore wind at Scheveningen, which is recorded as being exceptional for the time of year. There is nothing very noteworthy during the rest of the year, except a few days' frost in the second half of November.

1661. The early part of the year was very warm; roses were in leaf on January 21, the roads were dusty, and many flies were about. February 19 is mentioned as "the first winter day we have had this winter," but even then it was raining, and there is no reference to frost or snow. On April 23, Coronation Day, there was a severe thunderstorm. May was wet, and by June 2 they began "to doubt a famine." There were slight frosts in the early part of December.

1662. The winter was again very warm, "which do threaten a plague," and January 15 was "a fast day ordered by Parliament to pray for more seasonable weather." There was a frost on the 26th, but apparently an isolated one. Some time just before February 25 there was a great gale which did widespread damage to trees. May was very fine and warm. The rest of the summer and autumn calls for no remark. On November 27 there was a fall of snow, "which is a rare sight, that I have not seen these three years." This was the beginning of a cold spell; there was skating in St. James's Park by December 1 and there was heavy snow on the 7th and 10th. On the 12th there was a sudden thaw, but there was still ice in the park on the 13th, when the Duke of York "would skate although the ice was dangerous." The thaw must have been both sudden and intense, as two of the Admiralty officials were nearly drowned on their way to Portsmouth.

1663. There was frost from February 1 or perhaps earlier, till the 13th, with skating in the park; then came "a monstrous thaw," and rain on the 17th. In March the weather was very changeable, with a thunderstorm on the 15th and sleet on the 29th. The beginning of May was very hot, with a thunderstorm on the 5th, which caused extensive floods near Northampton. The summer was very wet. Prior to June 30 the weather had been wet for "two or three months together," and on July 21 "Parliament kept a fast for the present unseasonable weather"; nor are there signs of any improvement later in the summer; on August 28 there was "a very great frost they say abroad, which is much, having had no summer at all almost." Early in December there was some frost and snow, but it became warm again on the 10th.

1664. This winter seems to have been exceptionally warm on the whole; a little snow on March 21 is contrasted with the general mildness of the previous months. The summer was remarkable for numerous thunderstorms; "there was more thunder this year than of any man's memory, and so it seems in France and everywhere else." On August 10 there was a great thunderstorm, "with such continuous lightnings, not flashes but flames, that all the sky and ayre was light; and that for a great while, not a minute's space between new flames all the time." Toward the end of December a frost set in.

1665. The frost continued till January 18, when it thawed, but it froze again, and on the 26th mention is again made of "a change of the weather from a frost to a great rain." There were frosts in February and March, and on March 26 Pepys says, "The last winter hath been as hard a winter as any have been these many years." This was the year of the great plague of London, but the summer appears to have been normal. On November 22 a frost began which lasted till the end of the month or later; it then seems to have been warm till December

[1] Quotations from the Diary of Samuel Pepys on the weather.

11 or 12, when a severe frost began; by the 18th the Thames was full of ice; on the 20th it was "troublesome" to cross by boat; on the 22d "the river is frozen," though Pepys visited the Duke of Albemarle by water on the 24th. On the 27th a thaw had set in, though there was still much ice on the river.

1666. On January 24 there was a very great gale. February and March seem to have been dry; on March 18 "all cry out for lack of rain." There was another drought later, for on June 26 we read of rain "after a long drowth." Several thunderstorms are reported during the summer, but there was another drought in August, for when the great fire began on September 2 Pepys says that everything was combustible after so long a drought. The general wind direction during the fire is seen from the entry for February 3, 1667, where it is recorded that pieces of burnt paper were carried by the wind as far as Cranborne near Windsor, which makes the wind direction between east-northeast and east. The drought continued till September 9. After this date the weather seems to have been very changeable; probably a westerly type prevailed till about December 10, after which it was frosty till the end of the year.

1667. The frost continued and the Thames was covered with ice on January 1. On January 9 it thawed. February seems to have been warm till about the 25th, when a cold spell began which lasted till the middle of March; on March 6 the King said that it was the coldest day he had ever known in England, and the 7th seems to have been still colder. The end of March and the first three weeks of April seem to have been dry and warm; on April 21 it rained, "it not having rained for many weeks." There seem to have been a good many days of easterly wind in June and July, which helped the Dutch when they came up the Thames;. the month of July was dry till the 27th. The rest of the year calls for no special remark, except that no frost is mentioned, though November 10 was "mighty cold."

1668. There seems to have been no hard frost or snow this winter. March was mostly fine and dry with a drought that ended on April 4. On May 22 there was a heavy rain in London and to the north, but none at Newmarket; the rainfall must have been very heavy, as it caused floods near London, at Cambridge, and at Brampton in Huntingdonshire. The end of September and the beginning of October seem to have been exceptionally fine and warm, "as good as summer in all respects." There was frost on December 7, but it seems to have been unusually warm during most of December, as Pepys says that he only put on a waistcoat at night on December 24, "the first winter in my whole memory that ever I staid till this day before I did so."

1669. The early part of January was frosty and there was snow on the 13th. There are no weather entries for February, but the end of March was cold, with several falls of snow.

The diary ends on May 30 of this year.

* * * * *

The Duke of York, afterwards James II, seems to have been something of a meteorologist, for on April 4, 1668, he told Pepys his rules for knowing the weather, and he apparently made a very good forecast on that day, but Pepys does not tell us what his rules were.

It may be interesting to note that the sounds of distant gunfire were frequently heard in London. On the first four days of June, 1666, guns were plainly heard in London when the English and Dutch fleets were engaged off the North Foreland. On June 2 Pepys went "into the parke, and there we could hear the guns from the fleete most plainly," and later in the day he told the King and the Duke of York, and they also went into the park to hear the guns. But though heard in London they were not heard on the coast; the *Katherine* yacht saw the Dutch fleet on May 29, ran from them, and came up the Thames on June 2, having heard no firing at all. Evelyn heard the guns near London and went down to the coast, but found that nothing had been heard at Deal. On June 4 Pepys writes: "So walking through the parke we saw hundreds of people listening at the Gravell-pits, and to and again in the parke to hear the guns, and I saw a letter, dated last night, from Strowd, governor of Dover Castle, which says that the Prince [Rupert] come thither the night before with his fleete, but that the guns which we writ that we heard, it is only a mistake for thunder; and so far as to yesterday it is a miraculous thing that we all Friday, and Saturday and yesterday, did hear everywhere most plainly the guns go off, and yet at Deale and Dover to last night they did not hear one word of a fight nor think they heard one gun. This added to what I have set down before the other day about the *Katherine*, makes room for a great dispute in philosophy, how we should hear and they not, the same wind that brought it to us being the same that should bring it to them; but so it is." All this is quite in accordance with the audibility of gunfire in recent years.

On July 25th the fleets met again in the North Sea, and when Pepys went to Whitehall he was told that in the park "the guns are heard plain." Many went into the park, and the King and the Duke of York went into the bowling green and upon the leads, to hear the guns; Pepys joined them, and "it was pretty to hear how confident some would be in the loudnesse of the guns, which it was as much as ever I could do to hear them."

551.510.4 (784)

EXTRAORDINARY DUST STORM IN NORTH DAKOTA.[1]

By LEONARD P. DOVE and OTHERS.

[Abstract.]

That wind is a major agent [2] in moving material and fashioning the present earth features would seem self-evident, but seldom does the process intrude itself in a such a striking way as in the recent (Jan. 18–19, 1921) storm in North Dakota.

The storm in question, which apparently originated in Nevada and eventually covered an approximate area of 400,000 square miles, reached Grand Forks, N. Dak., on the 18th of January. On that morning the ground in North Dakota was partially snowcovered. During the afternoon clouds of dust began to arrive and soon collected in thick layers on the snow surface. A thaw set in during the next morning and by 10 a. m. was followed by a light rain which cleared the air and preserved the dust from further removal. On the night of the 19th another light snowfall occurred, and this in turn was followed by a slight thaw. Thus it became an easy matter to collect very complete dust samples. These samples were screened and then examined under a microscope. The greatest bulk of the material was probably of local origin. The finer particles were probably kept in suspension by the wind and brought down by the rain mostly to the eastward. The cinders are no doubt from the

[1] The dust storm of 1921. *Quarterly Jour. of the Univ. of N. Dak.*, vol. xi, No. 3, April, 1921.

[2] Keyes, Charles Rollin. Competency of wind in land depletion. Mo. WEATHER REV., Feb., 1917, 45: 57–58.